SOLECTRIA RENEWABLES

PVI 13KW
PVI 15KW

INSTALLATION AND OPERATION MANUAL

Commercial, Grid-Tied Photovoltaic Inverter

Subject to Change

IMPORTANT SAFETY INSTRUCTIONS

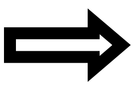
This manual contains important instructions that shall be followed during installation and maintenance of the PVI 13KW / PVI 15KW Inverter.

To reduce the risk of electrical shock, and to ensure the safe installation and operation of the inverter, the following safety symbols are used to indicate dangerous conditions and important safety instructions.



WARNING: This indicates a fact or feature very important for the safety of the user and/or which can cause a serious hardware damage if not applied appropriately.

Use extreme caution when performing this task.



NOTE: This indicates a feature that is important either for optimal and efficient use or optimal system operation.



EXAMPLE: This indicates an example.

SAVE THESE INSTRUCTIONS

IMPORTANT SAFETY INSTRUCTIONS

- All electrical installations shall be done in accordance with the local and national electrical codes ANSI/NFPA 70.
- The PVI 13KW / PVI 15KW contains no user serviceable parts. Please contact Solectria Renewables or a Solectria Renewables authorized system installer for maintenance. (See page 37 for Solectria Renewables contact information and authorized system installers.)
- Before installing or using the PVI 13KW / PVI 15KW, please read all instructions and caution markings in this manual and on the PVI 13KW / PVI 15KW unit as well as the PV modules.
- Connection of the PVI 13KW / PVI 15KW to the electric utility grid must be done after receiving prior approval from the utility company and performed only by qualified personnel.
- Completely cover the surface of all PV-arrays with opaque (dark) material before wiring them. PV arrays produce electrical energy when exposed to light and could create a hazardous condition.

SAVE THESE INSTRUCTIONS

Table of Contents

1 Introduction

The PVI 13KW / PVI 15KW is a commercial, 3-phase grid-tied PV inverter designed to be inter-connected to the electric utility grid. With this manual the PVI 13KW / PVI 15KW can be installed and operated safely. This installation guide is used as reference for the commissioning and as a guideline on how to use the inverter most effectively.

Feeding power into the grid involves conversion of the DC-voltage from the PV-array to grid compatible AC-voltage by “inverting” DC to AC. This unit feeds power into a standard 208V AC, 3-phase commercial, industrial or institutional facility’s electrical system which is connected to the electrical grid. (A 480V AC version is also available, and a 240VAC version as special order.)

If the PV system and inverter are providing the same amount of electrical power that the facility is using then no power is taken from or fed into the utility grid. If the facility is using more power than the PV system is providing, then the utility grid provides the balance of power. If the facility is using less power than the PV system is generating, then the excess is fed into the utility grid.

Be sure to look into local regulations regarding Net Metering/inter-connection in your local area. Note that some utilities need to change their revenue kWh meter for proper Net metering measurement and billing.



Fig. 1 Grid tied inverter application

2 Installation

WARNING: Before installing the PVI 13KW / PVI 15KW, read all instructions and caution markings in this manual and on the PVI 13KW / PVI 15KW as well as on the photovoltaic modules.

WARNING: Electrical installation shall be done in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.

WARNING: Connecting the PVI 13KW / PVI 15KW to the electric utility grid must only be done after receiving prior approval from the utility company and installation completed only by qualified personnel/licensed electrician(s).

2.1 Checking for Shipping Damage

The PVI 13KW / PVI 15KW inverters are thoroughly checked and tested rigorously before they are shipped. Even though they are delivered strapped onto a rugged, oversized pallet or in a crate, the inverters can be damaged in shipping which typically is the shipping company's fault in most cases.

Please inspect the inverter thoroughly after it is delivered. If any damage is seen please immediately notify the shipping company. If there is any question about potential shipping damage, contact Solectria Renewables. A photo of the damage may be helpful.

Do not accept unit if visibly damaged or note visible damage when signing shipping company receipt. Report damage immediately to shipping company. Do not remove the unit from pallet/packaging. If it is determined that the unit must be returned, an RMA# must be obtained from Solectria Renewables.

2.2 Inverter Mounting

PVI 13KW / PVI 15KW inverter is made up of a NEMA 3R (rainproof) industrial enclosure containing electrical and electronic components including transformer, filters, contactor, fusing, a sealed IP65 power & control electronic inverter unit (DMGI245) and AC and DC disconnects mounted on the sides of the main enclosure. On the standard versions, the disconnects are side facing. An option is available with forward-facing disconnects for tight spaces where width is limited (see fig 2.2b).

NOTE: If the PVI 13KW / PVI 15KW is mounted outside, make sure the enclosure door remains closed in case of rain during the installation process. Since the AC and DC connections are done in the disconnects only, there is no need to open the main enclosure during hook-up.

Notes regarding mounting and placement of the inverter.

Criteria for device mounting:

- Because the power electronics is in an IP65 sealed enclosure within the NEMA 3R main enclosure, the inverter can be mounted outdoors.

- The very longest life for the inverter can be achieved by mounting it in a clean, dry and cool location even given the unit's robust construction and powerful cooling system.

- For optimal electrical efficiency, use the shortest possible AC and DC cables and use the maximum allowable cable size.

- Avoid installation in close proximity to people or animals, as there is a small amount of high-frequency switching noise.

- Install the inverter in an accessible location following NEC codes for enclosure and disconnect door clearances and proximity to other equipment. (See mounting diagram, Fig. 2.2a & 2.2c)

- Although not required, installation at eye-height allows easy reading of the indicator LEDs on the right side of the inverter above the DC (PV) disconnect.

- For optimal inverter life and performance, do not mount the inverter in direct sunlight, especially in hot climates, although the inverter is designed to function at full power continuously in up to 50^{o}C ambient temperatures. In hot climates if the unit must be mounted in direct sunlight a metal sun-shield is recommended. It is recommended that the inverter is mounted on the north side of buildings or on the north side of a PV array (which can provide some shade).

CAUTION: Please follow these guidelines:

- The inverter weight is 380 lbs. Be sure to verify load capacity of floor, roof or wall mounting area.

- The ambient temperature must be between -25^{o}C and $+50\,^{o}$C for full power, continuous operation. (The inverter will automatically reduce power or shut down to protect itself if ambient air temperature rises above $50\,^{o}$C.)

- The National Electrical Code (NEC) requires that the inverter be connected to a dedicated circuit and no other outlets or device may be connected to this circuit. See NEC Section 690-64(b)(1). The NEC also imposes limitations on the size of the inverter and the manner in with it is connected to the utility grid. See NEC Section 690-64(b)(2).

- The cooling air exhausts at the bottom of the unit. Nothing should block the 2” clear space under the enclosure defined by the 2” tall mounting feet.

- A minimum distance of 10 inch (250mm) must be clear above the inverter for ventilation.

- The inverter must be mounted with at least a 2” open space behind it. (If wall-mounted, vertical, 2” x 2” uni-strut or channel can be used.) Air should be able to flow up behind the unit from below it to above it.

- If you are installing the inverter in a utility vault or electrical closet, the air circulation must be sufficient for heat dissipation – provide external ventilation, to maintain an ambient condition of less than 45-50 ^{o}C. The ambient temperature should be kept as low as possible.

- Correct mounting positions for the inverter: (side views)

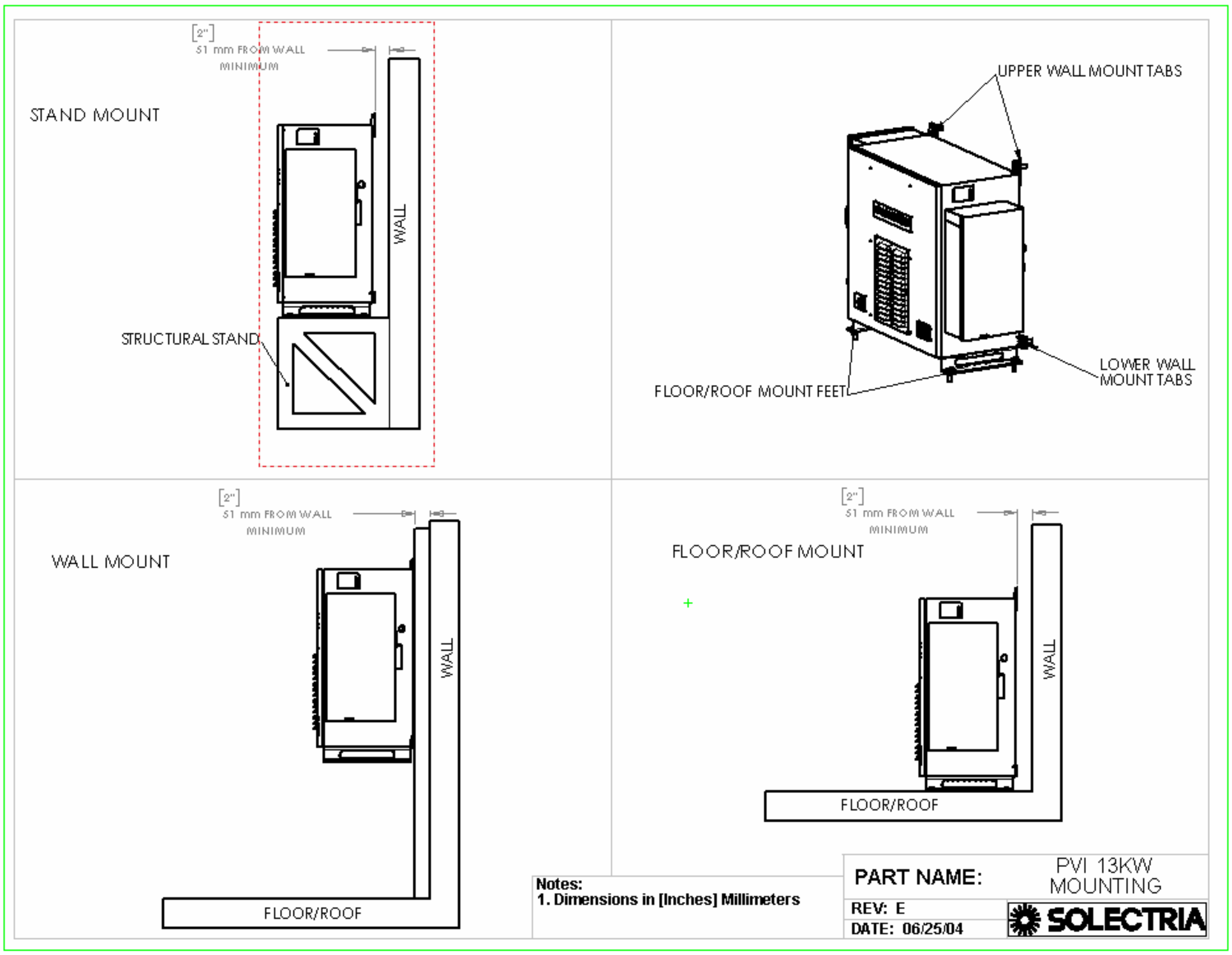


Fig. 2.1 How to mount the inverter

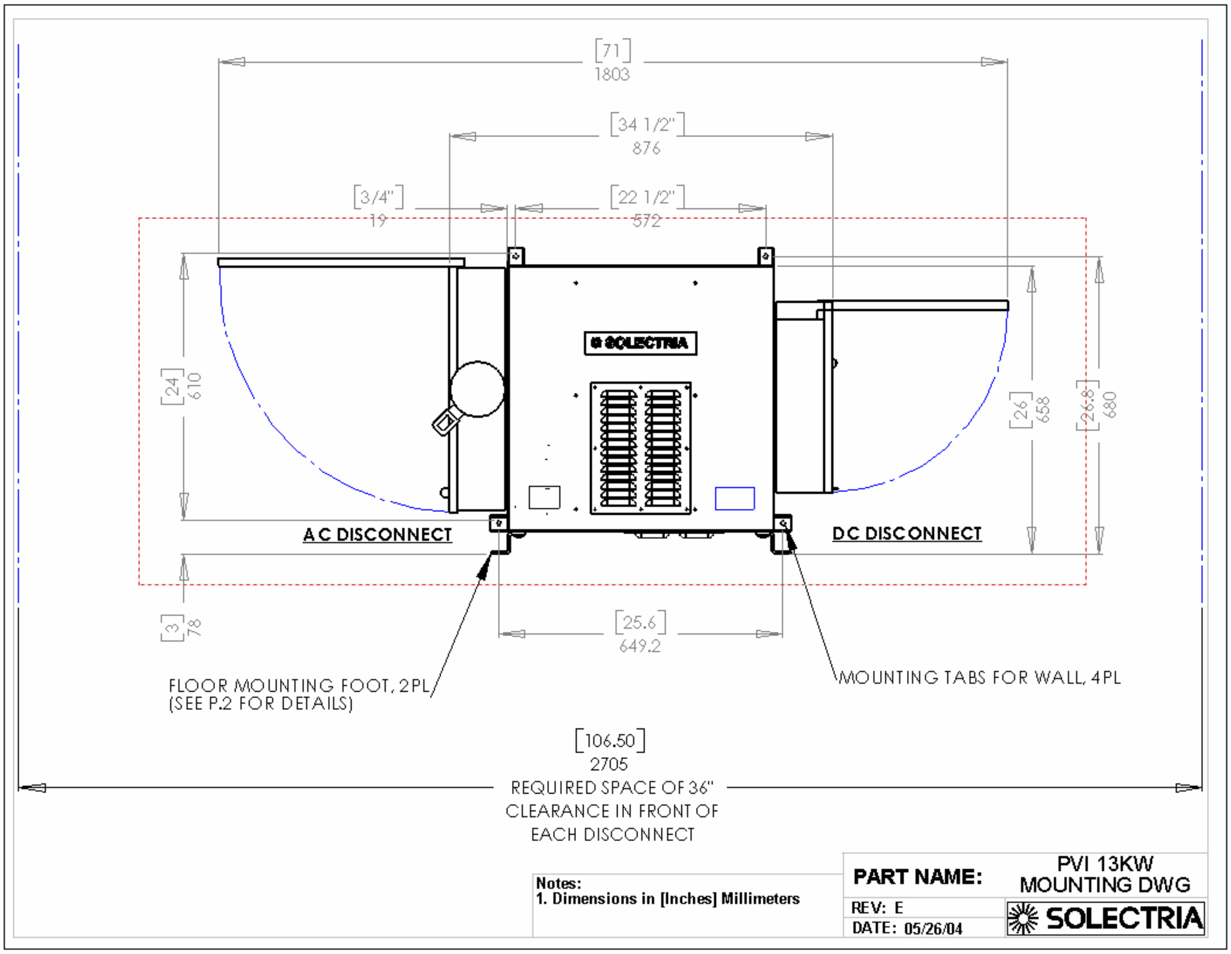


Fig. 2.2a PVI 13KW / PVI 15KW Mounting Diagram (standard side-facing disconnects)



Fig. 2.2b PVI 13KW / PVI 15KW with forward-facing disconnect option

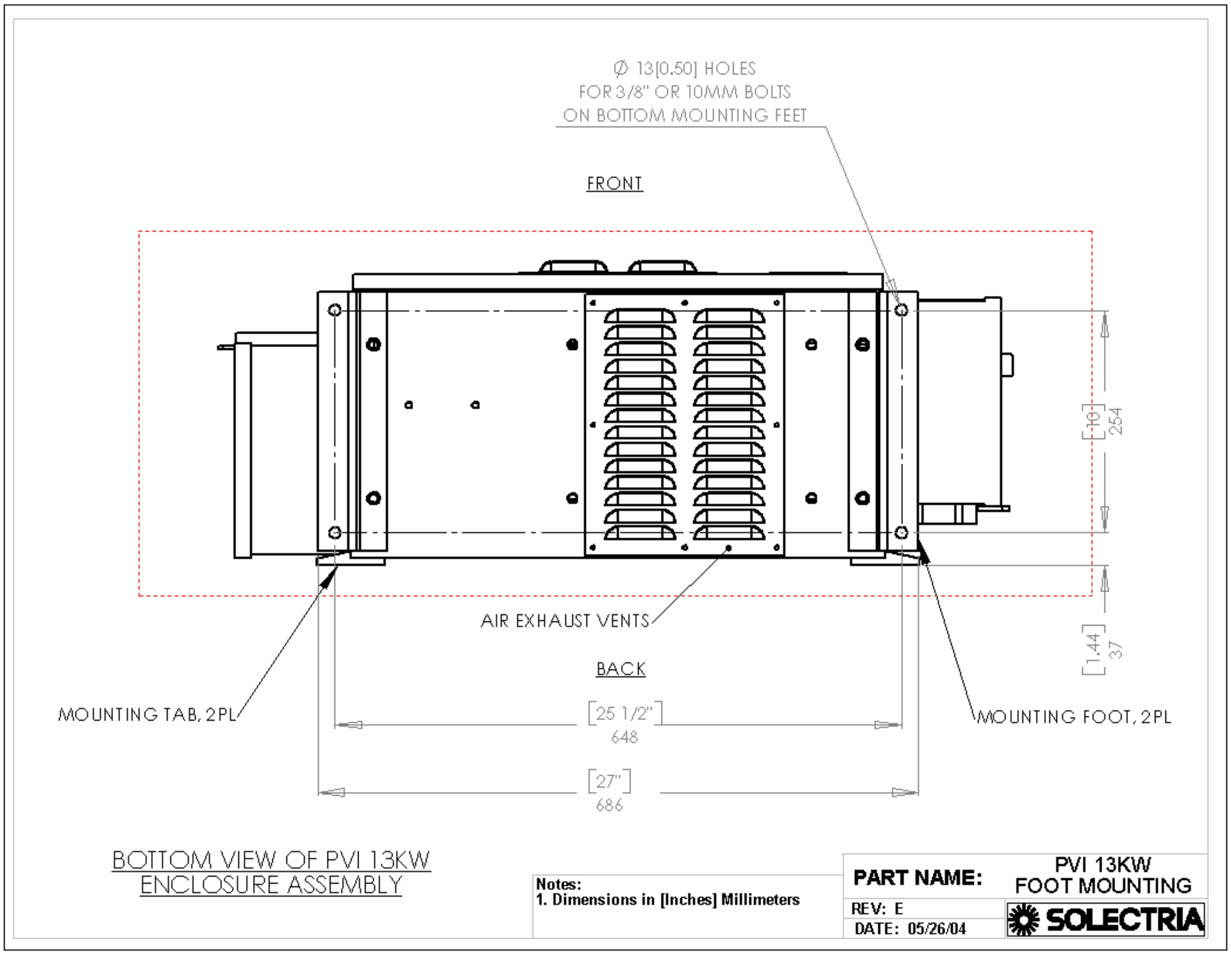


Fig. 2.2c PVI 13KW / PVI 15KW Mounting Diagram (standard side-facing disconnects)

Mounting Details

Using the mounting diagram Fig. 2.2 (a & c), choose whether floor/roof, wall or stand mounting will be used. A forward facing disconnect configuration is available as an option. This is especially useful in locations where limited space if available side-to-side to allow NEC clearance for the standard side facing disconnects. The inverter includes mounting feet for attachment to floors, roofs/roof plates/roof pans or stands. It also includes mounting tabs for wall mounting. You can also use a combination of both mounting provisions. For example, 2 bolts in floor mount feet and 2 bolts in the wall mount tabs.

It is recommended to use galvanized grade 5 or better bolts or stainless steel bolts. The correct bolt size is 3/8” (10mm) diameter. If wall mounting is used, be sure to verify sheer and pullout strength of anchors or other wall attachments.

WARNING: Severe injury or death could occur if the inverter mounting fails and the unit falls on a person.

NOTE: Always use all 4 mounting tabs if wall mounted.

NOTE: The nearly 380 lb. weight of the inverter will exert as much as 100 lbs. per bolt on the 4 wall mounts. Tension on the top bolts could also be 100 lbs.

Make sure an appropriate safety margin is used for both shear and tension of wall mounting bolts, anchors or other attachments.

NOTE: If the roof/floor mounting only uses the inverter's mounting feet, be sure you use all 4 available foot mount bolt positions. If a stand is used, be sure inverter is securely mounted to stand, the stand is adequately designed for the unit's weight and the stand is adequately attached to the floor/wall or roof.

NOTE: In the case of roof/floor mounting, temporary removal of disconnect doors may facilitate easy wiring of the unit (only while wiring) however, only do so if necessary and acceptable by local codes and applicable NEC requirements related to your particular mounting configuration. (Do not ever leave disconnect or main enclosure doors open when you are not actually working on the unit.)

2.3 DC Electrical Connection and AC Connection To Building and Electrical Utility Grid

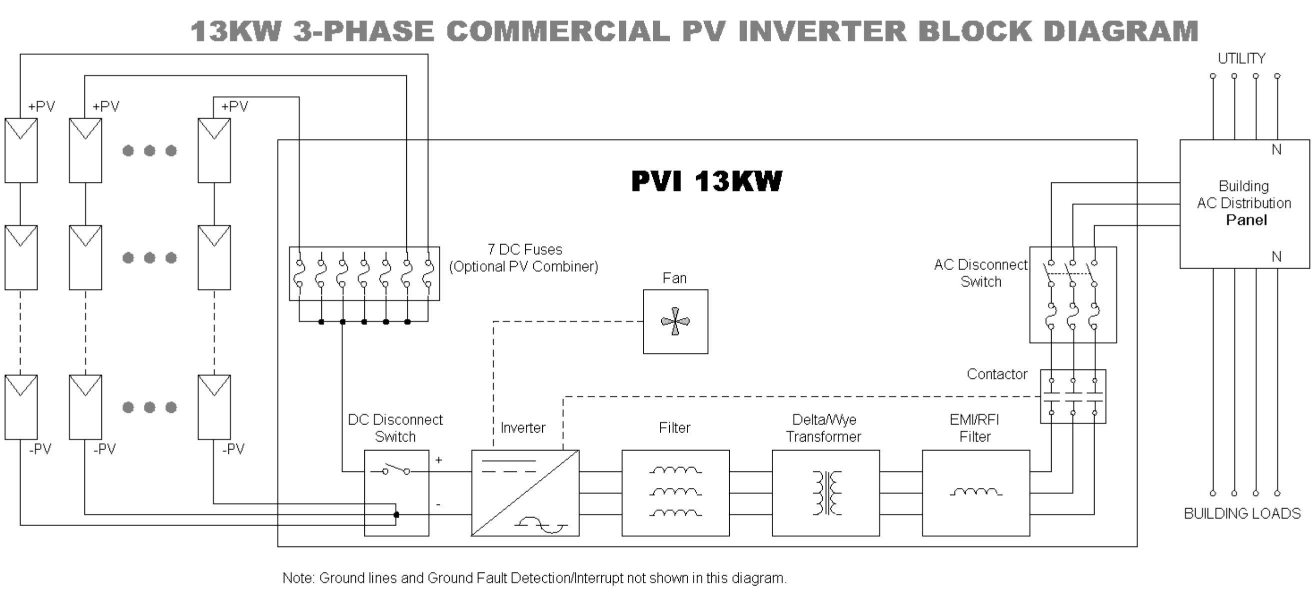


Fig. 3 Simplified electrical connection diagram

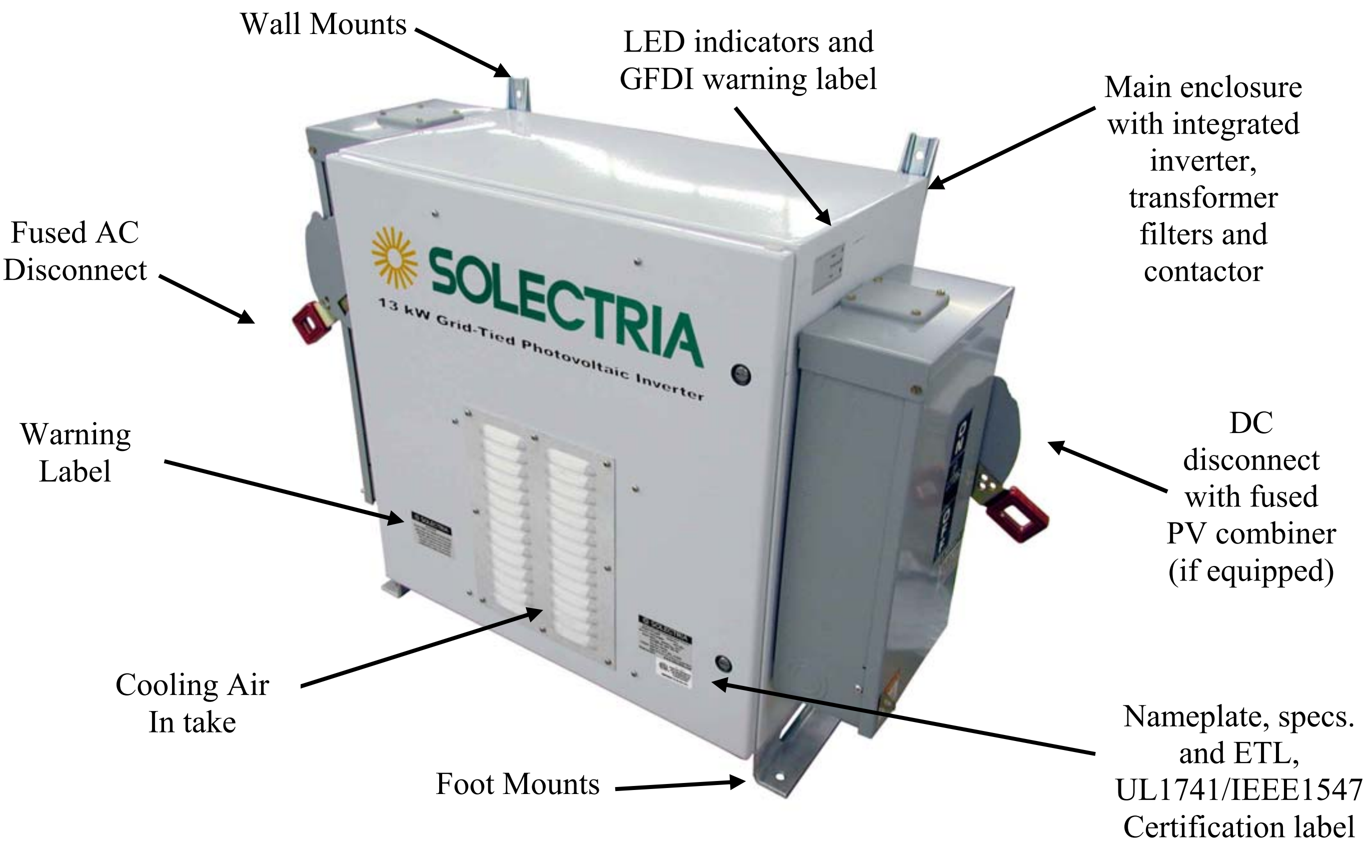


Fig. 4 "Integrated Inverter Package"

WARNING: All electrical installations shall be done in accordance with all local electrical codes and the National Electrical Code (NEC), ANSI/NFPA 70.

The negative DC, Photovoltaic connection is grounded within the inverter through the ground fault detection and interrupt circuit (GFDI). The PV negative should not be grounded at any other point in the system. The PV positive must never be grounded at any time. (Note that these instructions are reversed for optional positive grounded versions of the inverter.)

When conduit hubs are used on the AC and DC disconnect boxes in an outdoor or wet location, rain-tight or wet location hubs that comply with the requirements in the Standard For Fittings For Conduit and Outlet Boxes, UL514B, are to be used.

For the 3-phase AC wiring, use 6 AWG, (recommended for the 208VAC version) minimum 90°C (194°F), copper wire for connection with the inverter's 3-phase AC disconnect. (8 AWG recommended minimum for the 480VAC version.) (Disconnect terminals listed for 75°C wire. See NEC 310.10 regarding temperature ratings of wire.) Torque terminal screws to 45-50 in-lb. Voltage drop and other considerations may dictate that larger wire sizes be used. (A maximum of 2 AWG copper conductor wire, and 4 AWG copper ground wire can be used, but verify that any wire size choices meet NEC requirements)

For DC/PV wiring with the integrated, fused PV combiner (with 10-15 Amp fuses), use 12 AWG minimum 90^{o}C (194^{o}F) copper wire (10AWG recommended for most installations) for each positive lead of each PV string. (Fuse block terminals are listed for 75^{o}C wire. See NEC 310.10 regarding temperature ratings of wire.) Connect to each fuse and torque screws to 12 in–1b (1.3Nm). This fuse and wire rating must be compatible with PV module fuse and short-circuit current rating per NEC 690. (A maximum of 8 AWG copper conductors can be used.) The negative PV string connections are made to negative terminal block. Torque screws to 35 in–1b (13.5Nm). 4 AWG (recommended) DC equipment ground should be connected to the ground bar or if multiple 10-4 AWG DC equipment grounds meet NEC requirements for the installation, these can be terminated on the ground bar. (Note that the instructions for plus and minus are reversed for inverters with the positive grounding option)

If the inverter is not equipped with an integrated fused PV combiner, a minimum conductor size of 6 AWG, 90^{o}C (194^{o}F) copper wire must be used. (A maximum of 2 AWG copper conductor can be used for positive & negative conductors and 4 AWG DC equipment ground. It is also possible to use larger than 2 AWG + & - conductors if NEC and local code allows it for your installation and configuration. The + & - terminal block is rated to fit up to 2/0 AWG.) Torque screws to 120 in-lb. If the PV conductors are upsized, it may be necessary to upsize the DC equipment ground conductor or the grounding electrode conductor (see Grounding Electrode Conductor Section below).

Lightning and Surge Protection:

The inverter is designed with certain protections against surges in voltage including certification to UL 1741/IEEE 1547, ANSI/IEEE 62.41/62.42, however added protection and solid grounding provisions are important for best protection against utility surges and surges created by indirect lightning strikes.

The installation of a Delta lightning surge arrester or other UL listed arrester of the correct specification is recommended on both the DC and AC sides of inverter. This can be installed on the outside of the DC disconnect and wired using the manufacturer's directions. This device gives important added protection from indirect lightning strikes and resulting surges that provide protection beyond the inverter's UL1741 and other requirements. It is suggested to drive a ground rod specifically for the PV array. It is also a very good idea to have the lightning protection system of the building checked and upgraded if needed before the PV system is installed. (Are there air conductors along the roof-line of the building well above the PV array? Do you see a copper ground wire running from the air conductors to a ground rod?) These added protections are especially important for area prone to thunder storms and possible nearby lightning strikes. Although these added precautions cannot guarantee that there will be *no* damage from lightning, they can help prevent or limit potential damage.

Grounding Electrode Conductor:

As with all PV systems, a Grounding Electrode Conductor must be installed per UL690.47 (and 250.166). This conductor should be sized according to these NEC requirements. This conductor should be terminated on the ground bar in the AC disconnect. If required, an additional lug of the appropriate size for the grounding

electrode conductor can be added in the AC disconnect and bonded to the existing ground bar in the disconnect in a code compliant manner.

WARNING: The wiring connections of the inverter to the DC-voltage from the PV strings and the AC-voltage of the utility must be done with the AC and DC disconnects off, building AC source circuit panel/breaker off and the PV module strings disconnected (or covered up).

- Connect the building, 3-phase conductors and AC equipment ground at AC disconnect “LINE” terminals and ground bar.
- Connect the PV strings to the DC disconnect enclosure fuses (+) and negative terminal (-) if the inverter is equipped with fused PV combiner or connect the (+) and (–) PV array feeds to (+) and (–) terminals in the inverter DC disconnect if the inverter is not equipped with a fused PV combiner. Connect the DC equipment ground to the ground bar.
- Connect PV modules and strings or uncover them.
- Verify proper AC and DC voltages and polarity. The connection of the grid to the inverter must follow **clockwise** phase rotation for: L1/A, L2/B and L3/C. Test with a phase rotation tester or a scope-meter. (Extech, Fieldpiece, Fluke and UEi make phase rotation meters.) Do not assume existing color code or building wiring is correct! **You must verify clockwise rotation with a meter**. **NOTE:** It may be necessary to swap the phase A&B wires connecting the building circuit to the inverter’s disconnect if building phasing or wiring anywhere between utility and the inverter is not in proper phase sequence. Incorrect phase sequence at the 3-phase AC connection in the AC disconnect can damage the inverter. Turn on the inverter by switching building/utility 3-phase breakers ON then turning on inverter’s AC disconnect, then DC disconnect.

To disconnect the inverter from the building/utility grid, turn off the DC disconnect, then the AC disconnect. Turn off the AC 3-phase building/utility breaker if needed.



Connection to dedicated 208V AC, 50A 3-phase circuit. (60A for 15kW) 6-2 AWG copper wire. Torque to 45-50 in-lb. (Shown without plastic safety cover). If 480V AC versions, circuit should be 30-40A w/min. 8-10AWG wire.

50A Fuses (for PVI 13KW-208V and 240VAC versions), 600V, 50A FRS-R-50 Solectria Renewables P/N FRS-R-50. 60A Fuses for 15kW-208VAC version. (If 480V AC versions, use 40A fuses, FRS-R-40, Solectria Renewables P/N FRS-R-40.)

AC Equipment Ground connection 8-4 AWG copper wire

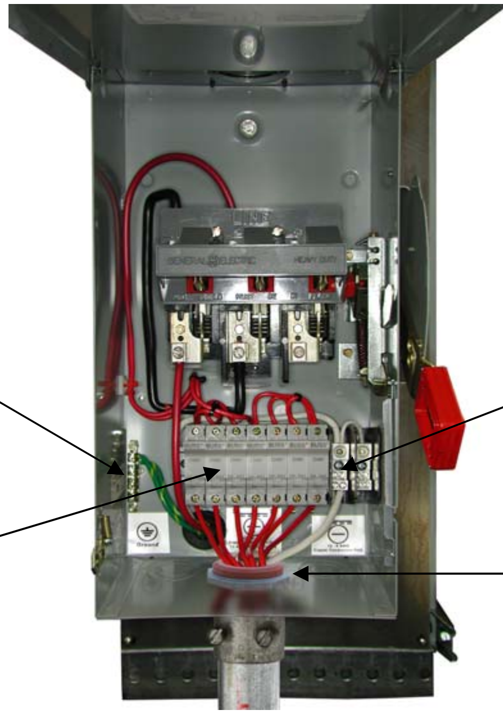


Fig. 6 DC disconnect with Fused PV Combiner (open showing connection)

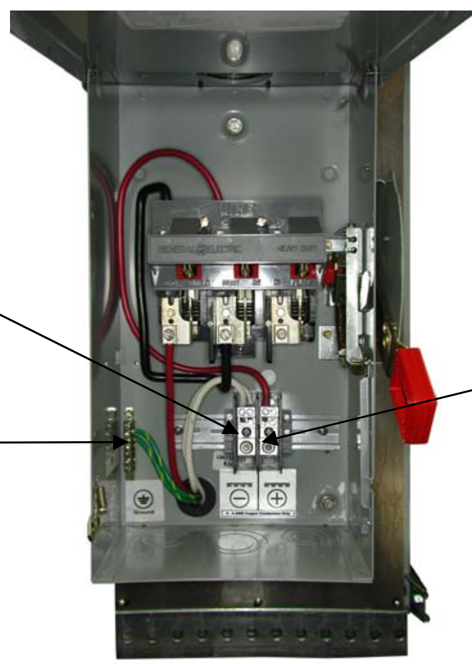


Fig. 7. DC disconnect without Fused PV Combiner (open showing connection)

WARNING: Fuses in the inverter's AC disconnect must only be replaced with Solectria Renewables Part Number FRS-R-50, or 50A, 600V, Bussmann, FRS-R-50 fuse. (Same for 240VAC version or 40A fuse of the same type for 480V AC version, Solectria Renewables Part Number FRS-R-50)

WARNING: If inverter is equipped with the fused PV combiner, fuses in DC disconnect must only be replaced with 500-600V DC rated fast-acting fuses, such as Solectria Renewables Part Number ELC-110013-001, or 10A midget, Bussmann, KLM-10. Always refer to PV module fuse ratings and specification before selecting or replacing fuses.

Connection Wiring To Electrical Utility Grid

The PVI 13KW / PVI 15KW must be connected to the grid with 3 conductors and an AC equipment grounding conductor. A 50A breaker is recommended for the dedicated PV system circuit breaker for the PVI 13KW-208VAC (or 240VAC) version. A 60A breaker should be used for the PVI 15KW-208VAC. (A 30-40A circuit breaker is recommended for the 480VAC versions.)

The grid impedance value at the connection point should be as low as possible to avoid an increase of the AC-voltage to non-permissible values while the inverter feeds to the grid. Minimizing wiring impedance also results in higher system efficiency.

EXAMPLE: The impedance is the sum of the electricity grid impedance at building distribution and all impedance values of conductors and connections.

Single conductor impedance values are:

- Approximately 0.14 Ω for a 250 feet (76.2 m) 8 AWG conductors
- Approximately 0.09 Ω for a 250 feet (76.2 m) 6 AWG conductors
- Approximately 0.05 Ω for a 250 feet (76.2 m) 4 AWG conductors
- Conductor impedance of < 0.09 Ω is recommended.

The total impedance phase to phase of the grid plus the interconnecting AC conductors should be less than 0.18 Ω. Lower resistance, heavier wires will allow more energy production from the PV system and will help prevent inverter trips required by UL1741 if line voltages are high or low. This is because with larger wires, the AC voltages at the inverter will be closest to the voltages at the building's circuit panel.

Connection of the PV-panels to the DC disconnect enclosure with or without integrated fused PV combiner

WARNING: Follow PV module manufacturer's directions. PV-arrays produce electrical energy when exposed to light and could create a hazardous condition. (One method used to assure safety from shock is to completely cover the surface of all PV-arrays with opaque (dark) material before wiring them.)

Depending on the type of PV-modules used it is possible to use several parallel strings. (Appendix B shows some example PV string sizing tables.)

WARNING: Before connecting the connectors of the PV-panel to the DC disconnect enclosure fused PV combiner (if equipped) or + and – terminal block if not equipped with combiner check the correct polarity and admissible PV-panel voltage between the + and the - cable connectors of the PV panel.

The PV-panel open circuit voltage must be below 475V DC ($V_{pv} < 475$ V DC) under all conditions as per NEC 690-7. Please read the Technical Info section and see PV string sizing table in Appendix B. All string sizing is approved by Solectria Renewables for your benefit upon order of inverter(s)

Inverter with fused PV combiner in DC disconnect enclosure:

There are 6-7 fuse blocks for up to 6-7 PV strings of 10-15A fuse rated PV module strings. The positive (+) wire from each string is connected to each fuse block bottom screw terminal. There are also 7 negative positions to be used for negative (-) connections on the negative (-) terminal blocks. (Note that these instructions are reversed for inverters equipped with the positive grounding option.)

Inverter without fused PV combiner in the DC disconnect enclosure:

There is a positive and negative terminal block for connection of a combined PV power feed from a customer-provided external fused PV combiner.

WARNING: A fused, correctly rated PV combiner must be used with this version of the inverter.

WARNING: Even when in the off position, the DC disconnect will remain live on the PV side ("line") when the PV modules are in daylight. The inverter ("load") side of the disconnect will also remain live after the disconnect has been shut off until 60 seconds after the LEDs turn off, as electrolytic DC bus capacitors in the inverter discharge.

http://www.wholesalesolar.com/inverters.html

Inverters connected in conjunction with emergency back-up generators:
Please follow all applicable NEC and local codes.
The inverters meet and are certified to all UL1741 and IEEE1547 requirements.

There are two methods to connect inverter or inverters to a grid-connected building that includes an emergency generator: (note that these are only thoughts on this subject – consult your inspector)
1.) Inverter(s) on the grid-side of the transfer switch that disconnect the building when the utility goes off. With this method, when the grid goes off, the inverters go off, the transfer switch disconnects the building from the PV inverters and grid. Then the generator starts and runs for the duration of power outage. In this case, the inverter is on the grid-side of the transfer switch and the inverters remain off the entire time until the grid returns.
2.) Inverter(s) on the load/building side of the transfer switch that disconnect the building when the utility goes off. With this method when the grid goes off, the inverters go off, the transfer switch disconnects the building with inverter(s) from the grid and the generator starts, the inverter(s) will attempt to start in parallel with the building/load/generator. With a large size generator and load, the inverter will most likely come back on and run well. If at any time the voltage or frequency of the system goes outside of the limits set in UL1741, then the inverter will go off and re-start 5 minutes later. This trial and restart sequence should not cause any trouble for the building, generator or inverter, however, if the PV system has close to or more than the power level of the generator and/or loads at any time, it is not recommended to use this hook up configuration (with the inverter on the building/load side of the transfer switch)

3 Commissioning the Inverter PV System

The inverter is mounted, all connections are made and you are ready to power it up.

NOTE: Make sure all tools; parts, etc. are removed from the vicinity of the inverter before turning on.

WARNING: Make a final check for correctness of all AC and DC wiring to the inverter and in the system.

NOTE: With the PV modules connected and inverter disconnects still off, it is a good final precaution to check PV voltage and polarity once more simply by carefully using a 600V, DC rated digital volt meter and probing the positive (+) and negative (-) PV connections in the disconnect enclosure. Also, verify clockwise phase rotation (L1-L2-L3) in the AC disconnect, using a phase rotation meter.

Turning on the inverter:

- Turn on the dedicated 3-phase circuit breaker on the building electrical panel
- Verify the proper CLOCKWISE phase sequence at the “line” side terminals of the AC disconnect

- Turn on the PVI 13KW / PVI 15KW inverter's 3-phase AC disconnect
- If equipped with Fat Spaniel Inverter-Direct monitoring option, refer to Fat Spaniel PV2Web Installation Manual for gateway startup sequence before turning on inverter's DC disconnect.
- Turn on the PVI 13KW / PVI 15KW inverter's DC disconnect
- Watch the LED indicators for initialization (all three LEDs on), then slow-blinking green.
- Listen for contactor clunk (inverter on-line) and fast blinking green LED
- Listen for slight 60 Hz hum (transformer on-line)
- Following the fast-blinking green LED and high frequency switching sound (inverter on-line and beginning to feed power into 3-phase circuit), the green LED should become solid indicating that the inverter is operating normally.

Operation:

The control electronics and DSP will be active as soon as DC (PV) voltage reaches 200V DC. The inverter will go on-line with the utility/building 3-phase grid when the DC voltage first exceeds 270V DC (strike voltage). Next, the inverter will load the array, bringing the DC voltage down from 270V DC to not less than 225V DC.

Once the array open circuit voltage exceeds 270VAC and there is enough PV power at 225V DC to back feed 3-phase AC power switching will automatically feed power to the grid.

Because the inverter goes completely off line at night or in dark conditions when no power can be produced, there are no idling losses, adding 1-2% additional energy production annually over an inverter design that remains on all the time.

Operating states, GFDI status and error indications shown by the LED indicators, which are described in chapter 4, "Power, GFDI and Error LED Indicators".

4 Power, GFDI and Error LED Indicators

The inverter operates automatically without the need for user interaction or maintenance.

The PVI 13KW / PVI 15KW automatically starts back feeding 3-phase AC power into the grid every morning as the sun rises, as soon as sufficient DC voltage and PV power is available. The inverter DSP runs through various checks before going online with the grid and feeding power into the grid.

The LED indicators mounted on the right-hand side of the enclosure just above the DC disconnect give the installer and user a good, quick look at what state the inverter is in and if it is operating normally.

GREEN – indicates “power”, the unit is powered up and/or feeding power to the grid

RED – “ERROR” or “FAULT”, the inverter is not providing power due to an error or fault

RED & YELLOW – together indicate that a ground fault has been detected and it must be located before the inverter will function. Check GFDI fuse if RED LED remains as solid.

If the GFDI fuse is blown, see “Opening the Main Enclosure” section and Fig. 9, “Description and Location of Components”. Follow these instructions carefully (disconnecting AC & DC power) and locate, check and replace the GFDI fuse with a 0.75A midget fuse 500V DC or 600V DC rated such as Solectria Renewables P/N KLK ¾ or KLKD 3/4, or Bussmann, KLK-3/4 or KLKD-3/4.



Fig. 8. The view from right-hand side of inverter above DC (PV) disconnect (LED indicator during initialization, all LEDs on)

Description of LED symbols used to indicate LED status in this manual

◯ LED Off

◔ LED flashing (25% on, 75% off)

◑ LED on once per second

⊗ LED on two times per second

◕ LED on with short interruptions (75% on, 25% off)

● LED on

LED indicator		Operating condition	Description
green: yellow: red:	○ ○ ○	standby (night)	input voltage < 125 VDC
green: yellow: red:	● ● ●	initialization	unit is being initialized
green: yellow: red:	● ○ ⊗	stop	input voltage low < 225V (270V @ startup)
green: yellow: red:	⊗ ○ ⊗	stop	input voltage high > 430V (475 VDC is the maximum allowable PV open circuit voltage)
green: yellow: red:	◔ ○ ⊗	waiting for stronger sun	available DC power is too low
green: yellow: red:	◔ ○ ○	waiting, checking grid	presence of valid grid conditions Is being checked
green: yellow: red:	⊗ ○ ○	starting / synchronizing	-starting transformer -synchronization to grid -closing contactor
green: yellow: red:	◔ ○ ●	waiting for AC disconnect/breaker to be closed	grid voltage is absent
green: yellow: red:	◕ ○ ●	AC fuse blown (one phase)	one AC power fuse blown or one v-sense fuse blown or one grid phase off/blown
green: yellow: red:	◑ ○ ○ ○ ○ ◑	AC VOLTAGE TOO HIGH (alternating green & red LED)	AC Grid Voltage above UL limits (>228V if 208VAC, >528V if 480VAC)
green: yellow: red:	● ○ ○	feeding grid MPP or constant voltage mode	normal daytime operation
green: yellow: red:	◕ ○ ○	de-rating mode or inverter at full power	reduction of power fed to the grid due to increased temperature of the heatsink or inverter is at full rated power
green: yellow: red:	○ ● ●	GFDI fuse failure	GFDI fuse is defective see chapter 5
green: yellow: red:	○ ○ ◑	failure 1 blink: HW failure #1 2 blinks: HW failure #2 5 blinks: HW failure #5	internal or external failure, exact description on blink code (1,2,5) call Solectria Renewables

green:	◑ ○ ○	5 minute wait for re-start (alternating green, yellow, & red LEDs in sequence)	utility required 5 minute wait for restart in process since grid (AC) restored
yellow:	○ ◑ ○		
red:	○ ○ ◑		
green:	◑ ○ ○ ○ ◑	Wrong AC phase sequence	Switch two phase wires for correct clockwise sequence
yellow:	○ ◑ ○ ◑ ○		
red:	○ ○ ◑ ○ ○		

5 Trouble Shooting

The PVI 13KW / PVI 15KW is designed, produced and rigorously tested for long life and reliability in a wide range of climate conditions, voltage and power levels.

With a properly shipped, sited, mounted, wired and tested installation, the integrated PVI 13KW / PVI 15KW inverter unit should give many years of trouble-free and maintenance-free service.

The following trouble shooting information will help in the event that the inverter does not function, stops functioning or does not provide full performance.

WARNING: Before attempting to open disconnects or the main enclosure, read the entire manual, especially warning messages and "Opening The Main Enclosure" later in this section. Only qualified personnel should attempt to open any of these enclosure doors or do any service or troubleshooting.

PV system not functioning

- Check LED indicator status
- Check connection to grid, 3-phase AC voltage & CLOCKWISE phase rotation (with meter)
- Check DC (PV) string connections or main PV feed conductor connections
- Verify PV voltage range including hot module temperature MPP voltage and cold module temperature, open circuit voltage (OCV)
- Contact installer or Solectria Renewables if malfunction persists
- If contacting Solectria Renewables for assistance, please provide part number, serial number, short description of problem (LED indicator status, when problem started, how often problem occurs, under what conditions the problem occurs) and information on PV modules (string layout, number of modules per string, number of strings, module model and part number, output power, short-circuit current and open circuit voltage)

Some specific problems that can be identified quickly

GFDI Problem: If the LED indicators show a ground fault problem but the GFDI fuse is not blown then a ground fault in PV array or wiring must be found. If the LED indicators show that the GFDI fuse is blown, the fault in PV array or wiring must be found and GFDI fuse replaced. For fuse replacement, see section 4 "Power, GFDI and Error LED Indicators".

Inverter over heating and power de-rating. If the power output is lower than normal and there is an LED indication of power de-rating due to high temperature, check the following

- Is the ambient air temp above 45-50^{o}C?
- Is the intake (front) louver grill or output (bottom) visibly blocked?
- Is the unit in direct sunlight which is adding extra heat to the inverter?

Unit over heating, power de-rating, or unit not putting out power

- Check insect screens in front louver grill on main enclosure door for clogging from dust, pollen and debris. The louver/grill can be removed with 8 Philips screws holding it on and insect screen can be cleaned or replaced (Solectria Renewables P/N HDW-150005-001)
- Fan not running, blocked or slow
  - Check fan fuse inside main enclosure (1A) AC
  - Check fan relay inside main enclosure
  - Check the fan, make sure it spins freely (when unit turned off)
- No grid sensing
  - Grid sensing fuses blown (0.5A or as labeled) AC inside main enclosure. Contact Solectria Renewables (Do not replace fuses, as this represents an abnormal failure).
- No LED indications when sun is shining. If grid voltage and DC (PV) voltage is present and no response from inverter is evident
  - Verify AC & DC (PV) voltages are within proper ranges
  - Verify fuses in AC & DC (PV) disconnect (If equipped with PV Combiner) are good

If at some point it is determined that the unit or any part of the unit should be shipped to Solectria Renewables for repair or replacement, be sure to get an RMA# from Solectria Renewables and use the same packing method as when it was shipped to you, or request instruction on packing and/or packing materials from Solectria Renewables to help insure a safe shipment.

Opening the Main Enclosure

Normally the main enclosure (or disconnects) will not have to be opened for any reason by the user. If opening the unit is necessary follow these guidelines:

WARNING: The inverter should only be opened by qualified service technician.

WARNING: Only open the inverter when clear and dry outside if the inverter is outdoors.

WARNING: Both DC and AC disconnects must be in the off position and wait 60 seconds after the LED indicators are off before opening as electrolytic capacitors on the internal DC "bus" are discharging during this time.

- Switch off DC disconnect
- Switch off AC disconnect (and AC building panel circuit breaker if desired)
- Watch until all LED indicators have been off for 60 seconds (if not already off)
- Use a large flat screwdriver or coin to turn latches ¼ turn counter-clockwise

See Fig. 9 and "Inside the Main Enclosure You Will See" section.

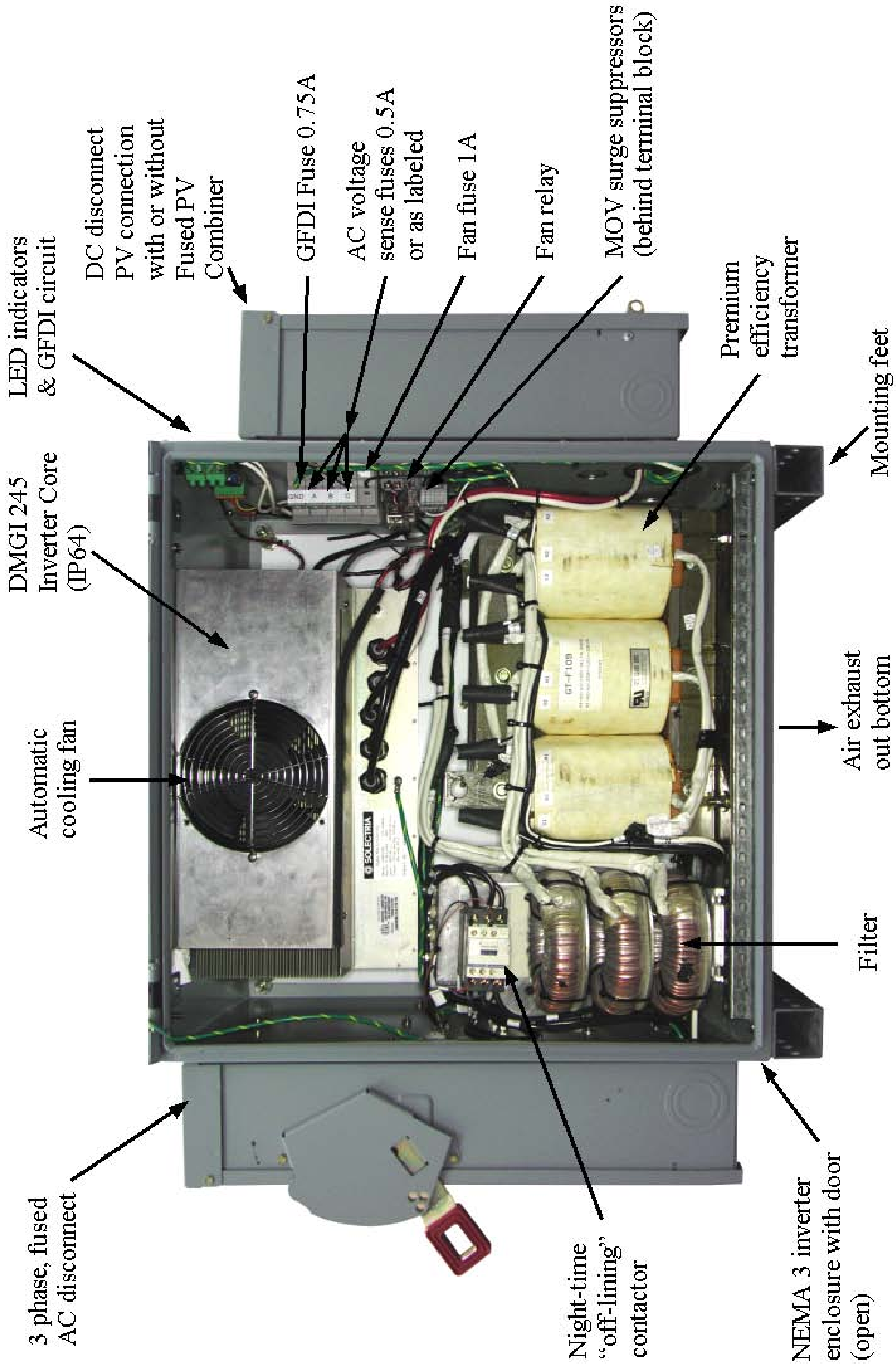


Fig. 9 Description and location of components

Inside the Main Enclosure you will see:

- DMGI245 Controller and power electronics inverter module with fan
- Isolation transformer
- Filters
  - Inductor assembly
  - Rectangular Filter (silver/gray box behind inductor and contactor)
- 3-phase off-lining contactor
- Fuse blocks
  - GFDI, 0.75A DC fuse
  - Grid Sense Phase A, 0.5A AC Fuse (or as labeled)
  - Grid Sense Phase B, 0.5A AC Fuse (or as labeled)
  - Grid Sense Phase C, 0.5A AC Fuse (or as labeled)
  - Fan, 1A AC Fuse
- Fan Control Relay
- GFDI/LED Indicator PCB

Before closing the main enclosure always check for any signs of problems such as corrosion, loose parts, insect or animal infestation, excessive dirt/dust or over heated or deformed/aged-looking parts. Also be sure if any wires were moved or cable ties cut, that they are replaced as new.

6 Product Warranty & RMA Policy

6.1 Warranty Policy

The Solectria Renewables Warranty Policy is stated below.

Solectria Renewables Warranty Coverage:
Solectria Renewables Limited Warranties are provided by Solectria Renewables, LLC. ("Solectria Renewables") and cover defects in workmanship and materials.

If equipped with optional Fat Spaniel hardware, Fat Spaniel hardware is not covered under the Solectria Renewables warranty but is covered by Fat Spaniel's 5-year warranty. Extended warranties covering Solectria Renewables inverters do not cover Fat Spaniel hardware.

Duration of a Solectria Renewables Warranty Period:
The warranty period is 60 months from the date of purchase of the PVI13KW / PVI15KW by the end user or 64 months after the delivery date from Solectria Renewables to distributor or dealer/installer, whichever is shorter. If a warranty extension has been purchased, the term is defined as extension beyond 60 months. For example, if a 5-year extension (to 10 years total) is purchased, the term becomes 120 months from date of purchase.

If Solectria Renewables repairs or replaces a product, its warranty continues for the remaining portion of the original Warranty Period or 90 days from the date of the return shipment to the customer, whichever is greater.

All warranties are null and void if full payment for products and associated shipping are not received in full and in a timely manner by Solectria Renewables.

Please contact Solectria Renewables Customer Service for further details on other products.

What will Solectria Renewables do?

Solectria Renewables will, at its option, repair or replace the defective product free of charge, provided that you notify Solectria Renewables of the product defect within the Warranty Period for your product, and provided that Solectria Renewables, through inspection, establishes the existence of such a defect and that it is covered by the Limited Warranty.

Solectria Renewables will, at its option, use new and/or reconditioned parts in performing warranty repair and building replacement products. Solectria Renewables reserves the right to use parts or products of original or improved design in the repair or replacement. All replaced products and all parts removed from repaired products become the property of Solectria Renewables.

Solectria Renewables will attempt to repair the unit within a reasonable time period (there is no reimbursement for lost energy production.)

Solectria Renewables covers both parts and labor necessary to repair the product, and return shipment to the customer via a Solectria Renewables-selected non-expedited surface freight within the contiguous United States and Canada. Alaska and Hawaii and Rest Of The World are excluded. Contact Solectria Renewables customer service for details on freight policy for return shipments outside of the contiguous United States and Canada.

In the event an extended warranty option has been purchased, this extended warranty only applies to exposed outdoor locations (defined as rooftop or open/unprotected locations) if the product has been purchased to include the gasket-sealed AC and DC disconnect option or has a protective cover around 3 sides of inverter unit (back and sides) and over the top, 4”-60” away from back and top and 30”-96” from sides.

Obtaining Service:

If your product requires troubleshooting or warranty service, contact your distributor or dealer/installer. If you are unable to contact your distributor or dealer/installer, or the distributor or dealer/installer is unable to provide service, contact Solectria Renewables directly at the number listed on the website in the customer service section for your product.

Solectria Renewables may send personnel to a jobsite or contract with an area technician, installer or other authorized, trained service personnel to service/replace components.

Reimbursement for contracted services: Solectria Renewables will submit a purchase order to the designated service personnel before work is performed. This purchase order will cover time expected for the required service and most likely an allocation for travel time.

Direct returns may be performed according to the Solectria Renewables Return Material Authorization Policy.

In any warranty claim, dated proof of purchase must accompany the product and the product must not have been disassembled or modified without prior written authorization by Solectria Renewables.
Proof of purchase may be in any one of the following forms:
- The dated purchase receipt from the original purchase of the product at point of sale to the end user, or
- The dated distributor or dealer/installer invoice or purchase receipt showing original equipment manufacturer (OEM) status, or
- The dated invoice or purchase receipt showing the product exchanged under warranty.

Solectria Renewables provides trouble-shooting service Monday-Friday, 9am-6pm EST. Once a problem is identified, necessary replacement component(s) will be dispatched within 1-2 days to the jobsite or the designated service personnel's address or will be brought to the site by Solectria Renewables' personnel.

What does the Solectria Renewables warranty not cover?
Solectria Renewables Limited Warranties do not cover normal wear and tear of the product or costs related to the removal, installation, or troubleshooting of the customer's electrical systems. These warranties do not apply to and Solectria Renewables will not be responsible for any defect in or damage to:
a) The product, if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment;
b) The product, if it has been subjected to fire, water, generalized corrosion, biological infestations, acts of God or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the Solectria Renewables product specifications including high input voltage from generators and lightning strikes;
c) The product, if repairs have been done to it other than by Solectria Renewables or authorized, trained service personnel;
d) The product, if it is used as a component part of a product expressly warranted by another manufacturer;
e) The product, if its original identification (trademark, serial number) markings have been defaced, altered, or removed;
f) The product, if it has been damaged in shipping (unless approved in writing by Solectria Renewables);
g) Any installation and operation beyond the scope covered by relevant safety regulations (UL1741, NEC, etc.);
h) Fat Spaniel hardware, if option has been purchased, is not covered under the Solectria Renewables warranty but is covered by Fat Spaniel's 5-year warranty. Extended warranties covering Solectria Renewables inverters do not cover Fat Spaniel hardware.

DISCLAIMER
SOLECTRIA RENEWABLES LIMITED WARRANTIES ARE THE SOLE AND EXCLUSIVE WARRANTY PROVIDED BY SOLECTRIA RENEWABLES IN CONNECTION WITH YOUR SOLECTRIA RENEWABLES PRODUCT AND ARE, WHERE PERMITTED BY LAW, IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS, GUARANTEES, REPRESENTATIONS, OBLIGATIONS AND

LIABILITIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE IN CONNECTION WITH THE PRODUCT, HOWEVER ARISING (WHETHER BY CONTRACT, TORT, NEGLIGENCE, PRINCIPLES OF MANUFACTURER'S LIABILITY, OPERATION OF LAW, CONDUCT, STATEMENT OR OTHERWISE), INCLUDING WITHOUT RESTRICTION ANY IMPLIED WARRANTY OR CONDITION OF QUALITY, DISTRIBUTOR OR DEALER/INSTALLER ABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY IMPLIED WARRANTY OF DISTRIBUTOR OR DEALER/INSTALLER ABILITY OR FITNESS FOR A PARTICULAR PURPOSE TO THE EXTENT REQUIRED UNDER APPLICABLE LAW TO APPLY TO THE PRODUCT SHALL BE LIMITED IN DURATION TO THE PERIOD STIPULATED UNDER THIS LIMITED WARRANTY.

IN NO EVENT WILL SOLECTRIA RENEWABLES, LLC, INCLUDING ITS SUPPLIERS, MANUFACTURERS, VENDORS, SUBCONTRACTORS, DISTRIBUTORS, DEALERS AND ANY OTHER AFFILIATES BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING WHETHER IN CONTRACT OR TORT INCLUDING WITHOUT RESTRICTION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, ANY PERSONAL INJURY, ANY DAMAGE OR INJURY ARISING FROM OR AS A RESULT OF ANY USE, MISUSE OR ABUSE, OR THE (IN-) CORRECT INSTALLATION, INTEGRATION OR OPERATION OF THE PRODUCT.

Solectria Renewables neither assumes nor authorizes any other person to assume for it any other liability in connection with the repair or replacement or the Product.

Exclusions of the Policy:
If your product is a consumer product, federal law does not allow an exclusion of implied warranties. To the extent you are entitled to implied warranties under federal law, to the extent permitted by applicable law they are limited to the duration of this Limited Warranty. Some states and provinces do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply to you. This Limited Warranty gives you specific legal rights. You may have other rights, which may vary from state to state or province to province.

WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, UNLESS SPECIFICALLY AGREED TO BY IT IN WRITING, SOLECTRIA RENEWABLES
(a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN MANUALS OR OTHER DOCUMENTATION PROVIDED BY IT IN CONNECTION WITH THE PRODUCT; AND
(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION.
THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER'S RISK.

WARNING: LIMITATIONS ON USE
Please refer to your product user manual for limitations on uses of the product. Specifically, please note that Solectria Renewables products are not intended for use in connection with life support systems and Solectria Renewables makes no warranty or representation in connection with any use of the product for such purposes.

Please review our Return Merchandise Authorization Policy for returning product to Solectria Renewables.

6.2 Return Material Authorization Policy

Please review our Return Merchandise Authorization Policy below after reviewing our Solectria Renewables Warranty Policy.

Obtaining a required, Return Material Authorization:
Before returning a product directly to Solectria Renewables you must obtain a Return Material Authorization (RMA) number and the correct factory "Ship To" address. Products must also be shipped prepaid. Product shipments will be refused and returned at your expense if they are unauthorized, returned without an RMA number clearly marked on the outside of the shipping box, if they are shipped collect, or if they are shipped to the wrong location.

Information Solectria Renewables needs when you are obtaining service:
1) The model names and serial number of your product
2) Information about the installation and use of the unit
3) Information about the failure and/or reason for the return
4) A copy of your dated proof of purchase.

Preparing the product for shipping:
1) Package the unit safely, preferably using the original box and packing materials. Please ensure that your product is shipped fully insured in the original packaging or equivalent. This warranty will not apply where the product is damaged due to improper packaging.
2) Include the following:
a. The RMA number supplied by Solectria Renewables, LLC clearly marked on the outside of the box
b. A return address to which the unit can be shipped. Post office boxes are not acceptable.
c. A contact telephone number where you can be reached during work hours.
d. A brief description of the problem.
Ship the unit prepaid to the address provided by your Solectria Renewables customer service representative.

Returning a product from outside of the USA or Canada:
In addition to the above, you MUST include return freight funds and are fully responsible for all documents, duties, tariffs, and deposits.

7 Technical Data

Technical Information and specifications – see appendix for complete PVI 13KW / PVI 15KW data sheet

Input (DC) from PV array:

- Maximum open circuit voltage of PV array: 475V DC

WARNING: NEC 690-7 must be followed to calculate the maximum number of PV modules allowed for a maximum inverter open circuit voltage (OCV) of 475V DC in extreme cold temperatures for the installation location.

- See PV string sizing charts in Appendix B

The open circuit voltage of PV modules depends on the cell temperature and the solar irradiation. The highest open circuit voltage occurs when the PV modules are at the coldest temperature and in bright sun. (See the following figure – Fig. 10)

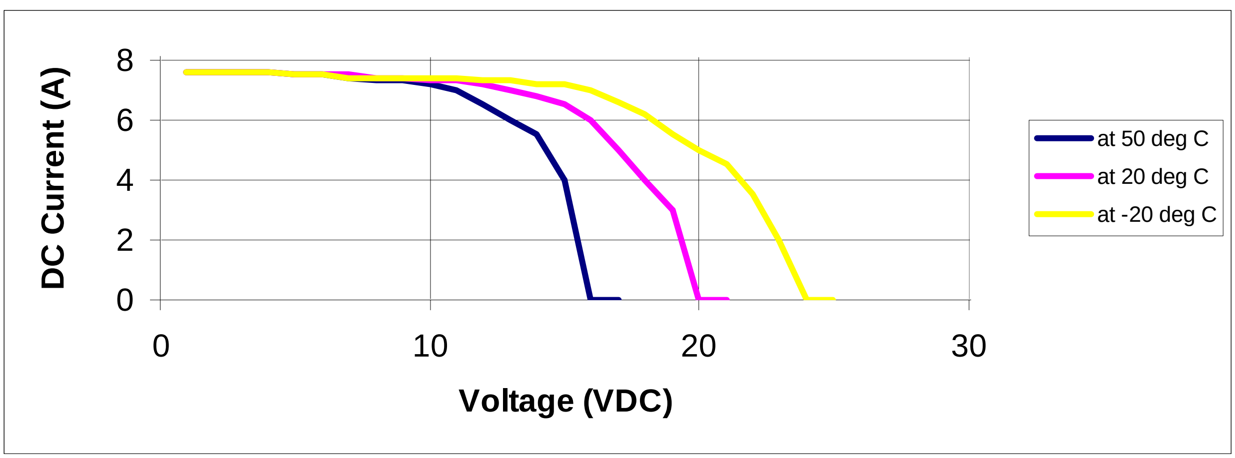


Fig. 10 Example representative PV module voltage versus current characteristic at various cell temperatures

Because the PV modules also have a reduction in voltage at high cell temperatures, you must make sure the MPP voltage of the strings will not drop below the minimum inverter DC input voltage of 225V DC in very hot temperature conditions.

Both the maximum open circuit voltage (OCV) when at cold extreme and minimum MPP voltage when at hot extreme can be calculated for a PV module using its specification sheet. PV module string sizing can then be used to determine how many modules can/should be used in a string.

Input DC (PV) specifications for PVI 13KW / PVI 15KW inverter

Input voltage MPP range	225V-385 VDC
CEC full power range	235V-380 VDC
Maximum open circuit voltage (under all conditions)	475 VDC
Maximum input current PVI 13KW	60A DC
Maximum input current PVI 15KW	70A DC
Maximum input power PVI 13KW	14 kW DC (inverter limited)
Maximum input power PVI 15KW	16 kW DC (inverter limited)
PVI 13KW Maximum recommended PV power (modules @ STC)	15 -16 kW DC (16 -17 kW for 0-5 deg flat roof systems)
PVI 15KW Maximum recommended PV power (modules @ STC)	16 -18 kW DC (18 - 20 kW for 0-5 deg flat roof systems)
DC disconnect for PV positive (+)	included
Ground fault protection	per UL 1741/2005 NEC 690.5
Ground fault detection, must detect	0.75 A
Ground fault interrupt	0.75 A

Output to AC grid connection:

The PVI 13KW / PVI 15KW is designed to feed power into a standard 60Hz, 3-phase 208V AC utility service or 208V AC provided within a facility by a step down transformer of not less than 15kVA. As required by NEC, there must be a dedicated 3-phase circuit breaker for the PV inverter connection. This circuit breaker (and wiring) must have a rating of at least 50A (50A recommended) for the 13kW, 208VAC (or 240VAC) version or 60A for the 15kW version. A 30-40A circuit breaker and 8-10AWG wiring is recommended for both of the 480VAC versions.

The inverter is designed to work with the range of AC voltage for a 208VAC 3-phase service defined by UL1741 of 183 to 228V. The 240VAC output version of the inverter has an AC voltage rating of 212 to 264VAC. The 480VAC output version of the inverter has an AC voltage range of 423 to 528VAC. (A 30-40A service and breaker is required, however 8AWG wire is recommended and 10AWG minimum wire size.)

Output (AC) specifications for PVI 13KW / PVI 15KW Inverter:

Nominal and Maximum output power power of the PVI 13KW		13.2 kW AC	
Nominal and Maximum output power power of the PVI 15KW		15.0 kW AC	
Operating voltage range (+10%/- 12%)	208VAC	240VAC	480VAC
Operating frequency range		59.3 to 60.5 Hz	
Operating voltage range (VAC)	183 - 228	211 - 264	423 - 528
Over / under voltage trip points and times	per IEEE Std. 1547-2003, Table 1		
Voltage measurement accuracy		+/- 2%	
Over / under frequency trip points and times	per IEEE Std 1547-2003, Table 2		
Frequency measurement accuracy		+/- 0.1 Hz	
Maximum Output Current PVI 13KW	37 A	32A	16 A
Maximum Output Current PVI 15KW	42 A	37A	18 A
Peak short circuit output current		75 A	
Total Harmonic distortion (THD) (@ full power)		< 5%	
Power Factor		> 95%	
Anti-islanding protection		per UL 1741, IEEE 1547	
AC disconnect, 3-phase		included	
Over current protection		inverter limited	
Short circuit protection		per UL1741 / IEEE1547	
Surge test		per UL1741 / IEEE1547	
Inverter peak Efficiency*		94.8%	

*Does not include MPP tracking and other transitory phenomena.

Other specifications:

DC combiner-fuse enclosure (Optional)	10A/15A fuses available 6-7 pole, NEMA 3R, TVSS
DC Disconnect (Integral)	Break load rated, NEMA 3R

Ambient Temperature	-25° to 50° C
Storage Temperature	-25° to 50° C
Cooling	Forced Convection
Enclosure	UL1741 rainproof
Enclosure-core electronics (designed to)	NEMA 4x, IP-64

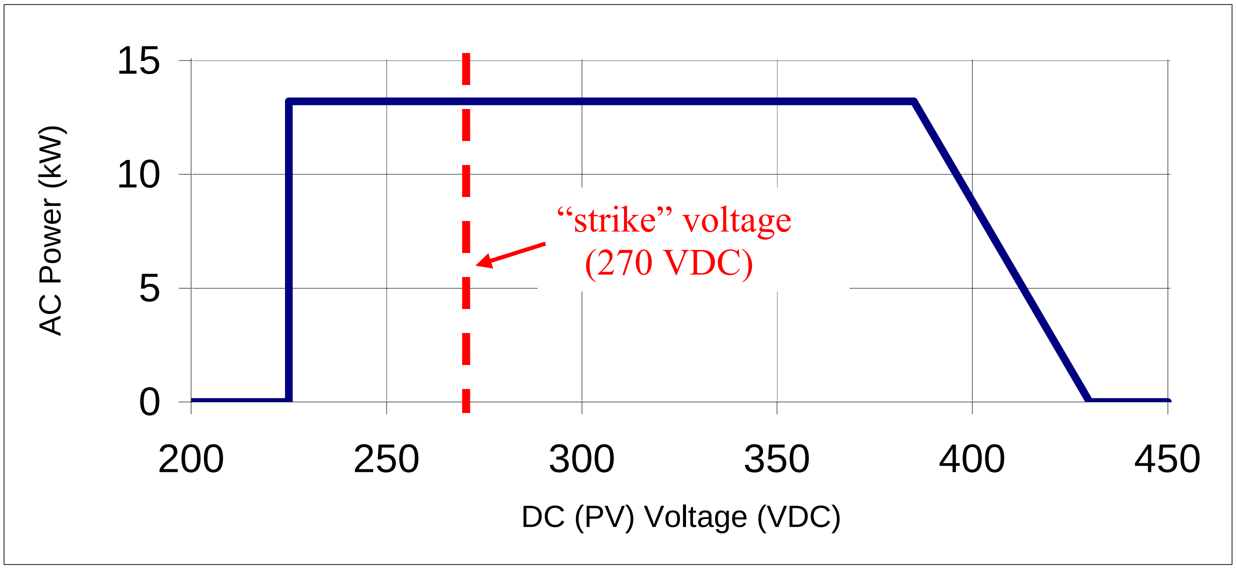


Fig. 11 Output power of PVI 13KW / PVI 15KW

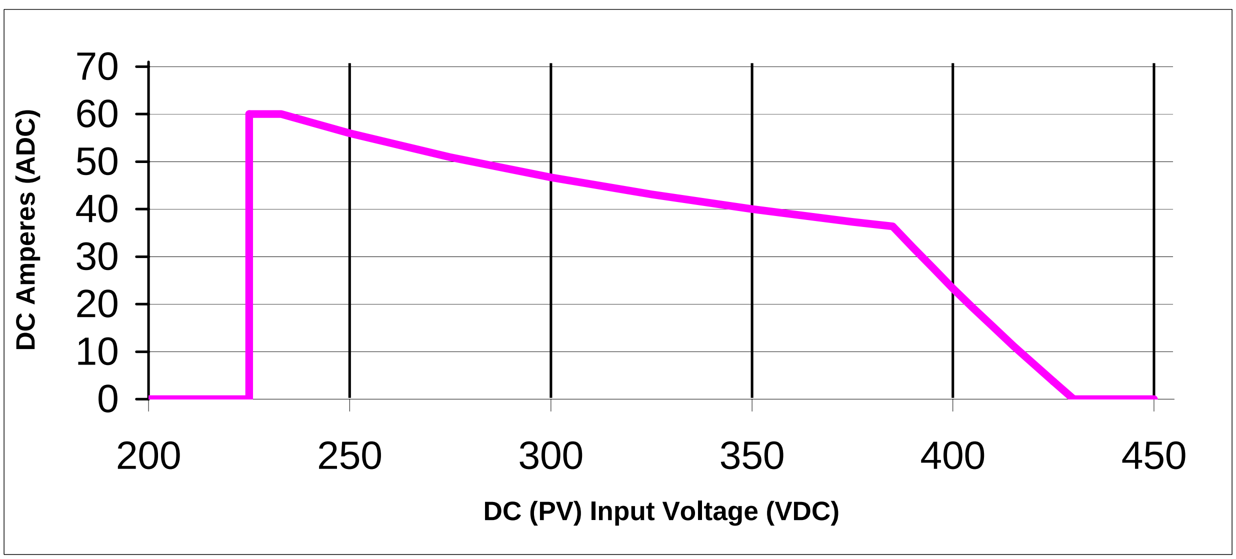


Fig. 12 Maximum continuous DC current input for PVI 13KW / PVI 15KW

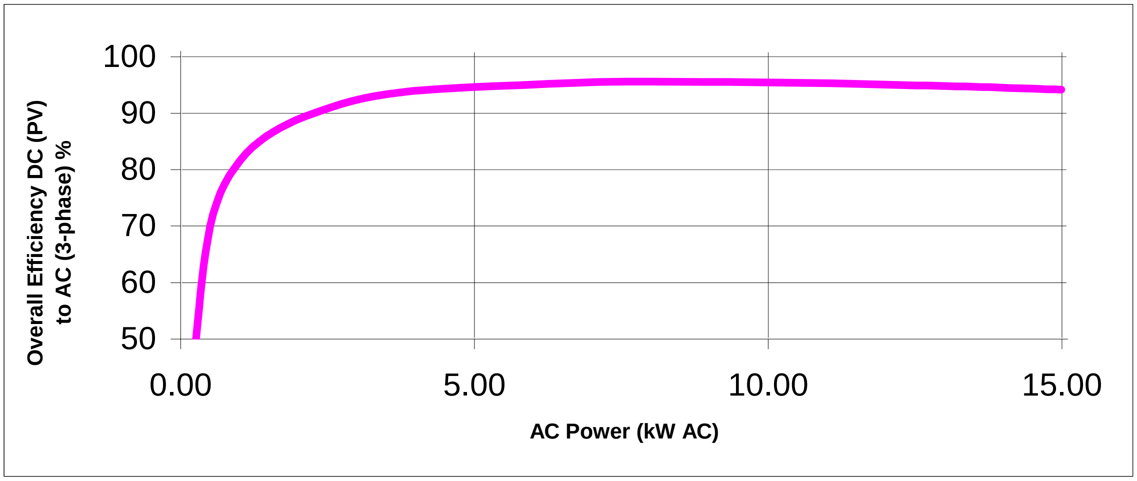
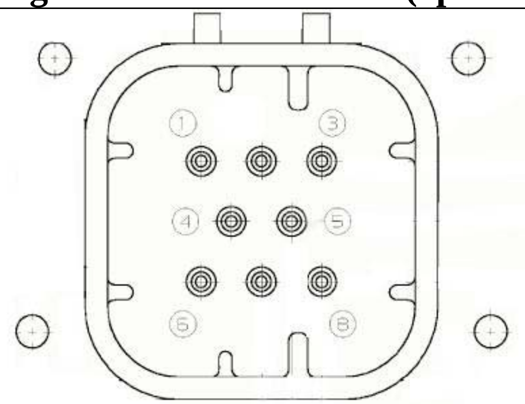


Fig. 13. PVI 13KW / PVI 15KW peak efficiency plot at 280VDC input and 25C ambient temperature. (peak efficiency values were measured with a 3% accurate power meter setup and do not include any losses caused by long wires and transitory phenomena, i.e. MPP tracking)

Pin assignment RS232 / RS485 (optional) and Internet Gateway connection



(front view of 8-pin communication connector on inverter, and back of mating connector)

1	RS232 TXD
2	RS232 RXD
3	RS232 GND
4	RS485 A (optional)
5	RS485 GND (optional)
6	RS485 B (optional)
7	RS485 GND
8	NC

Mating AMPSEAL 8-pin connector, Tyco part#: 776286-1
AMSEAL crimp contact, Tyco part#: 770854-3

Warning: RS232 and RS485 (optional) share the same serial port and only one can be used at one time! These can be toggled using PC software available from the factory if needed.

When equipped with an **optional RS485 communication interface**, this inverter can be daisy-chained with any other residential or commercial Solectria Renewables' PV inverter for data logging. Each inverter needs to be set to a unique network ID. To wire the RS485 communications to multiple inverters equipped with RS485 screw terminal port, locate the screw terminals at the top of the DIN-rail and run a twisted pair wire cable from one inverter to the next connecting "A" to "A" and "B" to "B". There is a convenient waterproof grommet on the right side of the inverter behind the DC disconnect for use with the RS485 cable.

Please call for information on data logging options / wiring diagrams. See the Fat Spaniel manual if your inverter is equipped with Fat Spaniel Inverter-Direct. If **Fat Spaniel or SolView gateway** is installed in the inverter, then the Ethernet CAT5 cable can be routed through the grommet on the right side of the inverter. Any RS485 daisy-chain connections to other inverters can also use the grommet. 208VAC inverters have an integrated gateway power supply but 480VAC units have a 120VAC supply than needs to be wired through the grommet as well. Note that the grommet can be replaced with a conduit fitting and conduit.

Appendix A – PVI 13KW / PVI 15KW Data Sheet

Link to brochure: http://www.solren.com/downloads/PVI_13KW.pdf

Appendix B – Example PV string sizing chart(s)

Link: http://www.solren.com/downloads/PVI_13KWString.pdf

The charts below are simplified string sizing examples. Please use the charts on the website for complete charts for use across the country.

Module Manufacturer	**Kyocera**									
Module Model	KC200GT			Power @ MPT		200.0	W			
Voltage @ MPT (STC)	26.3	VDC		PTC Power Rating		177.2	W			
Current @ MPT (STC)	7.61	ADC		Temp Coeff of Vmpt		0.123	V/degC	(Vmpt)		
Current, short circuit	8.21	ADC		Temp Coeff of Vocv		0.123	V/degC	(Vocv)		
OCV @ 25 deg C cells	32.9	VDC		NOCT (nom. cell temp)		47	deg C	116.6	deg F	
Modules total in array	44	55	66	77	88	48	60	72	84	96
Modules per string	11	11	11	11	11	12	12	12	12	12
Strings in Parallel	4	5	6	7	8	4	5	6	7	8
Voltage @ MPT (STC)	289.3	289.3	289.3	289.3	289.3	315.6	315.6	315.6	315.6	315.6
Vmpt @ max amb temp (30C, 86F amb)	246.0	246.0	246.0	246.0	246.0	268.4	268.4	268.4	268.4	268.4
Vmpt @ max amb temp (35C, 95F amb)	239.2	239.2	239.2	239.2	239.2	261.0	261.0	261.0	261.0	261.0
Vmpt @ max amb temp (40C, 104F amb)	232.5	232.5	232.5	232.5	232.5	253.6	253.6	253.6	253.6	253.6
Vmpt @ max amb temp (45C, 113F amb)	225.7	225.7	225.7	225.7	225.7	246.2	246.2	246.2	246.2	246.2
OCV @ 25 deg C cells	361.9	361.9	361.9	361.9	361.9	394.8	394.8	394.8	394.8	394.8
OCV @ coldest temp (-40C, -40F amb)	449.8	449.8	449.8	449.8	449.8	490.7	490.7	490.7	490.7	490.7
OCV @ coldest temp (-30C, -22F amb)	436.3	436.3	436.3	436.3	436.3	476.0	476.0	476.0	476.0	476.0
OCV @ coldest temp (-20C, -4F amb)	422.8	422.8	422.8	422.8	422.8	461.2	461.2	461.2	461.2	461.2
OCV @ coldest temp (-10C, 14F amb)	409.3	409.3	409.3	409.3	409.3	446.5	446.5	446.5	446.5	446.5
OCV @ coldest temp (0C, 32F amb)	395.7	395.7	395.7	395.7	395.7	431.7	431.7	431.7	431.7	431.7
Power @ MPT	8800	11000	13200	15400	17600	9600	12000	14400	16800	19200
PTC ACsystem power rating	7329	9161	10993	12826	14658	7995	9994	11993	13992	15991
Inverter Used	PVI 13KW	PVI 13KW	PVI 13KW	PVI 13KW	**PVI 15KW**	PVI 13KW	PVI 13KW	PVI 13KW	**PVI 15KW**	**PVI 15KW**
See string sizing on website --->	For Vmpt @ max amb temp and OCV @ coldest temperature, green is OK, red is not OK									
if color codes don't appear in	orange is acceptable but should be avoided where possible (inverter will hold at 225VDC).									
B&W manual printout.	purple is OK but indicates inverter will limit to 13.2 kW AC continuous output									
	pink is acceptable but should be avoided where possible (inverter will not run above 450VDC)									

Appendix C - Contact Information

Solectria Renewables LLC
360 Merrimack Street, Building 9
Lawrence, Massachusetts, 01843, USA

Tel: 978.683-9700
Fax: 978.683-9702
Email: inverters@solren.com
Website: www.solren.com

Authorized Distributors/Dealers/Installers/Designers: www.solren.com

Specific Link: http://www.solren.com/contact/dist.htm

Appendix D – UL1741/IEEE1547 Certification Letter

Intertek ETL SEMKO

April 6, 2007

Letter Report No. 3113125CRT-001a
Project No. 3113125

James Worden
Solectria Renewables, LLC
360 Merrimack Street
Lawrence, MA 01843 USA

Ph: (978) 683-9700
Fx: (978) 683-9702
email: James@solren.com

Subject: ETL testing of Solectria's PVI 13 kW and PVI 15 kW solar inverters

Dear Mr. Worden,

This letter confirms that Intertek Testing Services has completed our Safety evaluation of your PVI 13 kW and PVI 15 kW solar inverters, and have listed the following products to the Standard *Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources, UL 1741First Edition, Dated May 7, 1999 - Revisions through and including November 7, 2005.*

As part of the listing noted above, Intertek confirmed by test that the products above conform to the surge test requirements specified in IEEE C62.41.2.

If you have any questions related to the status of this product, please do not hesitate to contact the undersigned.

Prepared by:	Donald Osborne	Reviewed by:	Steven Pasternack
Title:	Project Engineer	Title:	Sr. Staff Engineer
Signature:		Signature	
Date	4/6/2007	Date:	4/6/2007

An Independent Organization Testing for Safety and Performance

Page 1 of 1

Intertek Testing Services NA, Inc.
3933 US Route 11 Cortland, NY 13045
Telephone: 1-607-758-6711 Fax: 1-607-753-1045 Web: www.intertek-etlsemko.com

SD 12.1.2 (3/22/07) Informative